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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/168,770	10/08/1998	RASHMI K. SHAH	TH-1042(US)	2851

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EXAMINER	
RIDLEY, BASIA ANNA	
ART UNIT	**PAPER NUMBER**
1764	

DATE MAILED: 04/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/168,770	SHAH ET AL.	
	Examiner	Art Unit	
	Basia Ridley	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) *8-12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 13-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. In view of the reply brief filed on 5 February 2004, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Claim Rejections - 35 USC § 102

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1-7 and 13-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Ruhl (EP 0 450 872).

Regarding claim(s) 1-6, 13, 16-17, Ruhl, in Fig. 4, disclose(s) a process heater comprising:

- an oxidation chamber (30, 68) having an inlet for an oxidant, an outlet for combustion products and a flow path between the inlet and the outlet (Fig. 4);
- a fuel conduit (60, 68) for transporting a fuel to the oxidation chamber, the fuel conduit (60, 68) containing a plurality of fuel nozzles (64) along substantially the entire length of the oxidation chamber (30, 68), each nozzle (64) providing fluid communication from within the fuel conduit

(60, 68) to the oxidation chamber (30, 68), the fuel nozzles being spaced so that fuel is added to the oxidation chamber (30, 68) at a rate that no flame results when the fuel is mixed with the oxidant flowing through the flow path in the oxidation chamber (Fig. 4);

- a preheater in fluid communication with the oxidation chamber inlet, the preheater capable of preheating said oxidant to a temperature at which when said oxidant and the fuel are mixed in said oxidation chamber, the temperature of said mixture of oxidant and fuel exceeds the autoignition temperature of said mixture (P5/L51-57, P7/L4-11, Fig. 4); and
- a process chamber (20) in a heat exchange relationship with the oxidation chamber (Fig. 4), whereby a controllable heat flux is provided to the process chamber at a sufficiently high rate to complete the process being conducted therein, and the heat transferred from the oxidation chamber to the process chamber does not cause the temperature of the mixture of the oxidant and the fuel within the oxidation chamber to decrease below the autoignition temperature of said mixture of oxidant and fuel in the oxidation (P5/L36-57, P6/L7-25, P7/L4-11, P8/L29-33, Fig. 4);
- a coke inhibitor injection system in fluid communication with the fuel conduit wherein an amount of coke inhibitor is supplied effective to inhibit coke formation at fuel conduit operating temperatures (P5/L8-10); wherein
- the fuel conduit is a tubular conduit essentially centrally located within the oxidation reaction chamber (Fig. 4);
- the oxidation chamber is essentially centrally located within the process chamber (Fig. 4);
- the process chamber is a pyrolysis reaction chamber for thermal cracking of hydrocarbons in production of olefins (P3/L3-21);
- the process chamber contains a catalyst and is used for steam methane reforming (P3/L3-21);

- the process chamber is used for an endothermic chemical reaction (P3/L3-210),
- wherein the endothermic chemical reaction is conducted in a single stage and heat is provided to the process chamber by the oxidation chamber at a controlled temperature profile (Fig. 4, P3/L3-21, P5/L36-57, P6/L7-25, P7/L4-11, P8/L29-33);
- the oxidant is preheated by heat exchange with effluent from the process chamber (Fig. 4).

Regarding claim(s) 7 and 14-15 it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Regarding limitations recited in claims 1-7 and 13-17 which are directed to a manner of operating disclosed process heater, the examiner notes that neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, the examiner notes that process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

Regarding claim(s) 18-21 and 23-24, Ruhl, in Fig. 4, disclose(s) a process heater comprising:

- an oxidation chamber (30, 68) having an inlet for an oxidant, an outlet for combustion products and a flow path between the inlet and the outlet (Fig. 4);

- a fuel conduit (60, 68) for transporting fuel into said oxidation chamber, said fuel conduit (60, 68) containing a plurality of fuel nozzles (64) distributed along substantially the entire length of said oxidation chamber (30, 68), said fuel nozzles (64) being spaced so that the flow of said fuel through said fuel nozzles (64) results in no flame when the fuel passes through the nozzles and is mixed with said oxidant flowing through said flow path in said oxidation chamber (Fig. 4);
- a preheater in fluid communication with said oxidation chamber inlet, for preheating said oxidant to above a temperature at which when said oxidant and said fuel are mixed in said oxidation chamber, the temperature of said mixture of said oxidant and said fuel exceeds the autoignition temperature of said mixture (P5/L51-57, P7/L4-11, Fig. 4); and
- a process chamber (20) in a heat exchange relationship with said oxidation chamber (Fig. 4), said plurality of nozzles distributed along substantially the entire length of said oxidation chamber being sized to provide the desired temperature distribution within said process chamber and the heat flux necessary to complete the process being conducted therein (P5/L36-57, P6/L7-25, P7/L4-11, P8/L29-33, Fig. 4); wherein
- the process chamber is used for an endothermic chemical reaction (P3/L3-210);
- the process chamber is a pyrolysis reaction chamber for thermal cracking of hydrocarbons in production of olefins (P3/L3-21);
- the endothermic chemical reaction is conducted in a single reaction stage at a controlled temperature profile (Fig. 4, P3/L3-21, P5/L36-57, P6/L7-25, P7/L4-11, P8/L29-33);
- the process chamber contains a catalyst and the process conducted in said process chamber is steam hydrocarbon reforming (P3/L3-21); and
- said oxidant is preheated by heat exchange with effluent from the process chamber (Fig. 4).

Regarding claim(s) 22 it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Regarding limitations recited in claims 18-24 which are directed to a manner of operating disclosed process heater, the examiner notes that neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, the examiner notes that process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

4. Claims 1-4, 13, 16-19, 21 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Mikus (USP 5,255,742).

Regarding claim(s) 1-4, 13 and 16-17, Mikus, in Fig. 2-3 and 6, disclose(s) a process heater comprising:

- an oxidation chamber having an inlet for an oxidant, an outlet for combustion products and a flow path between the inlet and the outlet (Fig. 2-3);
- a fuel conduit for transporting a fuel to the oxidation chamber, the fuel conduit containing a plurality of fuel nozzles (13) along substantially the entire length of the oxidation chamber, each nozzle (13) providing fluid communication from within the fuel conduit to the oxidation chamber, the fuel nozzles (13) being spaced so that fuel is added to the oxidation chamber (30, 68) at a rate

that no flame results when the fuel is mixed with the oxidant flowing through the flow path in the oxidation chamber (Fig. 3);

- a preheater in fluid communication with the oxidation chamber inlet, the preheater capable of preheating said oxidant to a temperature at which when said oxidant and the fuel are mixed in said oxidation chamber, the temperature of said mixture of oxidant and fuel exceeds the autoignition temperature of said mixture (C3/L25-30, Fig. 2-3); and

- a process chamber (1) in a heat exchange relationship with the oxidation chamber (Fig. 2-3), whereby a controllable heat flux is provided to the process chamber at a sufficiently high rate to complete the process being conducted therein, and the heat transferred from the oxidation chamber to the process chamber does not cause the temperature of the mixture of the oxidant and the fuel within the oxidation chamber to decrease below the autoignition temperature of said mixture of oxidant and fuel in the oxidation (C9/56-C10/L13, Fig. 2-3);

- a coke inhibitor injection system in fluid communication with the fuel conduit wherein an amount of coke inhibitor is supplied effective to inhibit coke formation at fuel conduit operating temperatures (C6/L25-C7/L8); wherein

- the fuel conduit is a tubular conduit essentially centrally located within the oxidation reaction chamber (Fig. 2-3);

- the oxidation chamber is essentially centrally located within the process chamber (Fig. 3);

- the process chamber is used for an endothermic chemical reaction (abstract);

- the endothermic chemical reaction is conducted in a single stage and heat is provided to the process chamber by the oxidation chamber at a controlled temperature profile (Fig. 6 and C9/L56-C10/L14);

- the oxidant is preheated by heat exchange with effluent from the process chamber (Fig. 2).

Regarding limitations recited in claims 1-4, 13 and 16-17 which are directed to a manner of operating disclosed process heater, the examiner notes that neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, the examiner notes that process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

Regarding claim(s) 18-19, 21 and 24, Mikus, in Fig. 2-3 and 6, disclose(s) a process heater comprising:

- an oxidation chamber having an inlet for an oxidant, an outlet for combustion products and a flow path between the inlet and the outlet (Fig. 2-3);
- a fuel conduit for transporting fuel into said oxidation chamber, said fuel conduit containing a plurality of fuel nozzles (13) distributed along substantially the entire length of said oxidation chamber, said fuel nozzles (13) being spaced so that the flow of said fuel through said fuel nozzles (13) results in no flame when the fuel passes through the nozzles and is mixed with said oxidant flowing through said flow path in said oxidation chamber (Fig. 2-3);
- a preheater in fluid communication with said oxidation chamber inlet, for preheating said oxidant to above a temperature at which when said oxidant and said fuel are mixed in said oxidation chamber, the temperature of said mixture of said oxidant and said fuel exceeds the autoignition temperature of said mixture (C3/L25-30, Fig. 2-3); and

- a process chamber (1) in a heat exchange relationship with said oxidation chamber (Fig. 2-3), said plurality of nozzles distributed along substantially the entire length of said oxidation chamber being sized to provide the desired temperature distribution within said process chamber and the heat flux necessary to complete the process being conducted therein (C5/L41-65, C9/L56-C10/L13, Fig. 2-3); wherein
- the process chamber is used for an endothermic chemical reaction (abstract);
- the endothermic chemical reaction is conducted in a single reaction stage at a controlled temperature profile (Fig. 6 and C9/L56-C10/L14);
- said oxidant is preheated by heat exchange with effluent from the process chamber (Fig. 2).

Regarding limitations recited in claims 18-19, 21 and 24 which are directed to a manner of operating disclosed process heater, the examiner notes that neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, the examiner notes that process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claim(s) 5-7, 14-15, 20 and 22-23 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Mikus (USP 5,255,742), as applied to claims 1 and 18 above.

Regarding claim 5-7, 14-15, 20 and 22-23, Mikus discloses all of the claim limitations as set forth above. Additionally Mikus discloses that the heater is used for an endothermic process (abstract) and that the absence of flame eliminates the flame as a radiant heat source and results in more even temperature distribution throughout the length of the heater (abstract). Further said heater eliminates the hot spots within the heater and structures surrounding the heater, which originate from the radiant heat transfer from the luminous portion of the flame. Said process heater not only optimizes the process operation but it is also less expensive than a process heater operating with flames because of less expensive materials of construction (C2/L4-12). The reference does not explicitly disclose said heater being used to provide heat to specific endothermic chemical reactors, such as pyrolysis reaction chambers, chambers containing catalysts for various endothermic chemical reactions, vacuum distillation chambers and hydrocarbon distillation column reboilers. Since all of claimed specific chemical reactions are endothermic processes, which routinely are heated by process heaters comprising burners operating with flames they will benefit from the benefits associated with process heater of Mikus as set forth above. An ordinary artisan at the time of the invention would have replaced the heaters in various endothermal process chambers with the process heater of Mikus for the purpose of providing more even temperature distribution throughout the length of the burner and lowering the costs of said process chambers.

Regarding limitations recited in claims 5-7, 14-15, 20 and 22-23 which are directed to a manner of operating disclosed process heater, the examiner notes that neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115.

Further, the examiner notes that process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

7. Claim(s) 1-7 and 13-24 is/are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruhl (EP 0 450 872) in view of Mikus (USP 5,255,742).

Regarding claim(s) 1, Ruhl, in Fig.1, disclose(s) a process heater comprising:

- an oxidation chamber (30) having an inlet (40) for an oxidant, an outlet (54) for combustion products and a flow path between the inlet and the outlet (Fig. 1);
- a fuel conduit (34) for transporting a fuel to the oxidation chamber, the fuel conduit (34) containing a fuel nozzle (Fig. 1), said nozzle providing fluid communication from within the fuel conduit (34) to the oxidation chamber (30);
- a preheater in fluid communication with the oxidation chamber inlet (40), the preheater capable of preheating said oxidant to a temperature at which when said oxidant and the fuel are mixed in said oxidation chamber, the temperature of said mixture of oxidant and fuel exceeds the autoignition temperature of said mixture (P5/L51-57, P7/L4-11, Fig. 1); and
- a process chamber (20) in a heat exchange relationship with the oxidation chamber (Fig. 1), whereby a controllable heat flux is provided to the process chamber at a sufficiently high rate to complete the process being conducted therein, and the heat transferred from the oxidation chamber to the process chamber does not cause the temperature of the mixture of the oxidant and the fuel within the oxidation chamber to decrease below the autoignition temperature of said mixture of oxidant and fuel in the oxidation (P5/L36-57, P6/L7-25, P7/L4-11, P8/L29-33, Fig. 1).

Further Ruhl discloses an embodiment wherein the process heater is designed and operated to provide uniform temperature profile (P6/L9-10). To enable operation at uniform temperature profiles the reference discloses embodiments where the so called "low temperature seals" are replaced by "high temperature seals" (P6/L29-31) or where an alternative mode of operation is provided which allows said "low temperature seals" to effectively operate at high temperatures (P6/L57-P7/L2). While Ruhl shows embodiments of the process heater operating without a flame (see Fig. 4), such operation is not disclosed with respect to Fig. 1.

Mikus, in Fig. 2-3 and 6, teaches a process heater comprising:

- an oxidation chamber having an inlet for an oxidant, an outlet for combustion products and a flow path between the inlet and the outlet (Fig. 2-3);
- a fuel conduit for transporting a fuel to the oxidation chamber, the fuel conduit containing a plurality of fuel nozzles (13) along substantially the entire length of the oxidation chamber, each nozzle (13) providing fluid communication from within the fuel conduit to the oxidation chamber, the fuel nozzles (13) being spaced so that fuel is added to the oxidation chamber (30, 68) at a rate that no flame results when the fuel is mixed with the oxidant flowing through the flow path in the oxidation chamber (Fig. 3);
- a preheater in fluid communication with the oxidation chamber inlet, the preheater capable of preheating said oxidant to a temperature at which when said oxidant and the fuel are mixed in said oxidation chamber, the temperature of said mixture of oxidant and fuel exceeds the autoignition temperature of said mixture (C3/L25-30, Fig. 2-3); and
- a process chamber (1) in a heat exchange relationship with the oxidation chamber (Fig. 2-3), whereby a controllable heat flux is provided to the process chamber at a sufficiently high rate to

complete the process being conducted therein, and the heat transferred from the oxidation chamber to the process chamber does not cause the temperature of the mixture of the oxidant and the fuel within the oxidation chamber to decrease below the autoignition temperature of said mixture of oxidant and fuel in the oxidation (C9/56-C10/L13, Fig. 2-3).

In said process heater preheating at least the air stream and then mixing the fuel gas into the combustion air in relatively small increments will result in the flameless combustion (C4/27-40). The absence of flame eliminates the flame as a radiant heat source and results in more even temperature distribution throughout the length of the burner (abstract). Further it eliminates the hot spots within the burner and structures surrounding the burner, which originate from the radiant heat transfer from the luminous portion of the flame. Said process heater not only optimizes the process operation but it is also less expensive than a process heater operating with flames because of less expensive materials of construction (C2/L4-12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the heater in the apparatus of Ruhl with the heater of Mikus for the purpose of providing more even temperature distribution throughout the length of the burner and lowering the costs of said apparatus.

Regarding claims 2-6, 13 and 16-17 Ruhl in view of Mikus disclose all of the claim limitations as set forth above. Additionally Ruhl discloses the process heater further comprising:

- a coke inhibitor injection system in fluid communication with the fuel conduit wherein an amount of coke inhibitor is supplied effective to inhibit coke formation at fuel conduit operating temperatures (P5/L8-10); wherein

- the fuel conduit is a tubular conduit essentially centrally located within the oxidation reaction chamber (Fig. 4);
- the oxidation chamber is essentially centrally located within the process chamber (Fig. 4);
- the process chamber is a pyrolysis reaction chamber for thermal cracking of hydrocarbons in production of olefins (P3/L3-21);
- the process chamber contains a catalyst and is used for steam methane reforming (P3/L3-21); and
- the process chamber is used for an endothermic chemical reaction (P3/L3-210),
- wherein the endothermic chemical reaction is conducted in a single stage and heat is provided to the process chamber by the oxidation chamber at a controlled temperature profile (Fig. 4, P3/L3-21, P5/L36-57, P6/L7-25, P7/L4-11, P8/L29-33);
- the oxidant is preheated by heat exchange with effluent from the process chamber (Fig. 4).

Regarding claim(s) 7 and 14-15 it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Regarding limitations recited in claims 1-7 and 13-17 which are directed to a manner of operating disclosed process heater, the examiner notes that neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, the examiner notes that process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions

relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

Regarding claim(s) 18, Ruhl, in Fig.1, disclose(s) a process heater comprising:

- an oxidation chamber (30) having an inlet (40) for an oxidant, an outlet (54) for combustion products and a flow path between the inlet and the outlet (Fig.1);
- a fuel conduit (34) for transporting fuel into said oxidation chamber, said fuel conduit (34) containing a fuel nozzle (Fig. 1) distributed along substantially the entire length of said oxidation chamber (30);
- a preheater in fluid communication with said oxidation chamber inlet, for preheating said oxidant to above a temperature at which when said oxidant and said fuel are mixed in said oxidation chamber, the temperature of said mixture of said oxidant and said fuel exceeds the autoignition temperature of said mixture (P5/L51-57, P7/L4-11, Fig. 1); and
- a process chamber (20) in a heat exchange relationship with said oxidation chamber (Fig. 1), said nozzle being sized to provide the desired temperature distribution within said process chamber and the heat flux necessary to complete the process being conducted therein (P5/L36-57, P6/L7-25, P7/L4-11, P8/L29-33, Fig. 4).

Further Ruhl discloses an embodiment wherein the process heater is designed and operated to provide uniform temperature profile (P6/L9-10). To enable operation at uniform temperature profiles the reference discloses embodiments where the so called "low temperature seals" are replaced by "high temperature seals" (P6/L29-31) or where an alternative mode of operation is provided which allows said "low temperature seals" to effectively operate at high temperatures (P6/L57-P7/L2). While Ruhl shows embodiments of the process heater operating without a flame

(see Fig. 4), such operation is not disclosed with respect to Fig. 1.

Regarding Mikus the same comments apply as set forth above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the heater in the apparatus of Ruhl with the heater of Mikus for the purpose of providing more even temperature distribution throughout the length of the burner and lowering the costs of said apparatus.

Regarding claims 19-21 and 23-24 Ruhl in view of Mikus disclose all of the claim limitations as set forth above. Additionally Ruhl discloses the process heater wherein:

- the process chamber is used for an endothermic chemical reaction (P3/L3-210);
- the process chamber is a pyrolysis reaction chamber for thermal cracking of hydrocarbons in production of olefins (P3/L3-21);
- the endothermic chemical reaction is conducted in a single reaction stage at a controlled temperature profile (Fig. 4, P3/L3-21, P5/L36-57, P6/L7-25, P7/L4-11, P8/L29-33);
- the process chamber contains a catalyst and the process conducted in said process chamber is steam hydrocarbon reforming (P3/L3-21); and
- said oxidant is preheated by heat exchange with effluent from the process chamber (Fig. 4).

Regarding claim(s) 22 it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Regarding limitations recited in claims 18-24 which are directed to a manner of operating disclosed process heater, the examiner notes that neither the manner of operating a disclosed

device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, the examiner notes that process limitations do not have patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Response to Arguments

9. Even though this art has been relied upon before, a number of teachings (for example Ruhl P6/L9-10, P6/L29-31 and P6/L57-P7/L2 or Mikus, Fig. 2) in combinations with other teachings of the references have not previously been highlighted as grounds of rejection. Arguably, this would constitute new grounds of rejection, therefore the examiner has reopened prosecution.

10. Applicant's arguments filed on 29 August 2003 and 5 February 2004 have been fully considered but are moot in view of the new ground(s) of rejection.

Conclusion

11. In view of the foregoing, none of the claims are allowed.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Basia Ridley, whose telephone number is (571) 272-1453.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola, can be reached on (571) 272-1444.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Technical Center 1700 General Information Telephone No. is (571) 272-1700. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Questions on access to the Private PAIR system should be directed to the Electronic Business Center (EBC) at (866) 217-9197 (toll-free).

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